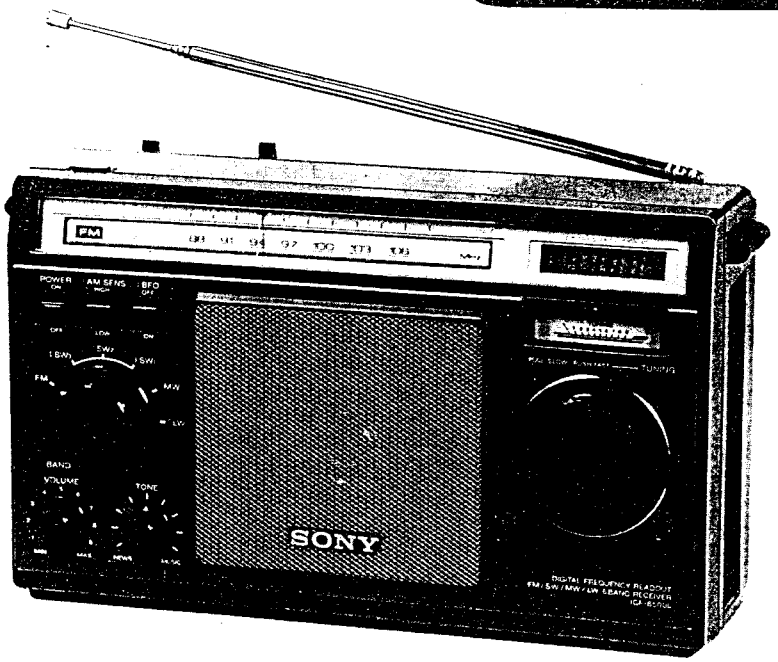
ICF-6500L

AEP Model



FM/SW/MW/LW 6BAND RECEIVER

SPECIFICATIONS

Frequency range	FM 87.6 – 107 MHz SW_1 3.9 – 10 MHz (77 – 30 m) SW_2 11.7 – 20 MHz (25.6 – 15 m) SW_3 20 – 26.1 MHz (15 – 11.5 m) MW 530 – 1,605 kHz (566 – 187 m) LW 150 – 255 kHz (2,000 – 1,176 m)
Antennas	SW/FM: Telescopic antenna MW/LW: Built-in ferrite bar antenna
Speaker	Approx. 10 cm (4 inches) dia.
Power output	1,100 mW (at 10% harmonic distortion)
Outputs	Earphone jack (minijack) for 8-ohm earphone or load impedance 10 kilohms or higher Recording output jack (minijack) output level 1 mV (–60 dB) output impedance 1 kilohm
Power requirements	9 V dc, six batteries IEC designation R14 (size C) 12 V car battery with optional Sony DCC-120 car battery cord 24 V car battery with optional Sony DCC-240 car battery cord
Battery life	Approx. 24 hours using Sony SUM-2 (NS) New Super batteries or Eveready No. 1235 Heavy Duty batteries
Dimensions	Approx. 289 × 169 × 102 mm (w/h/d) (11½ × 6¾ × 4⅛ inches) incl. projecting parts and controls
Weight	Approx. 1.85 kg (4 lb 1¼ oz) incl. batteries

MICROFILM

SONY®

SERVICE MANUAL

Handling Precautions for MOS ICs

- A MOS IC (IC102) in this set should be replaced as a counter block.

Generally, the insulation resistance of the oxide layer in MOS IC structures is very high, and the oxide layer is very thin. Because of this, it is possible that the static voltages usually present on clothes and the human body will be enough to generate a potential difference across the insulator, high enough to cause a breakdown of the insulating layer.

The following precautions should be taken while handling these ICs.

(Particular care should be taken under conditions of low humidity.)

Precautions in Replacing MOS ICs

1. Store new ICs by inserting them into a urethane-polyester cushion (which is somewhat conductive), or wrapping it in aluminum foil, so that all the pins are at the same potential.
   (The ICs should be stored in that manner until mounted on the circuit board.)

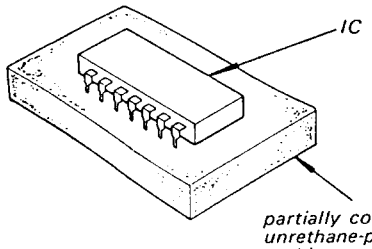


Fig. A

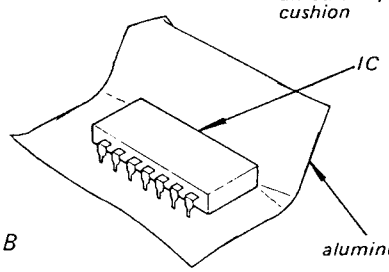


Fig. B

2. Check the soldering iron for possible power-line leakage current. Make sure that there is no leakage path by connecting an ohmmeter to the tip of the soldering iron and the plug as shown in Fig. C. If there is a leakage path, use some other soldering iron.

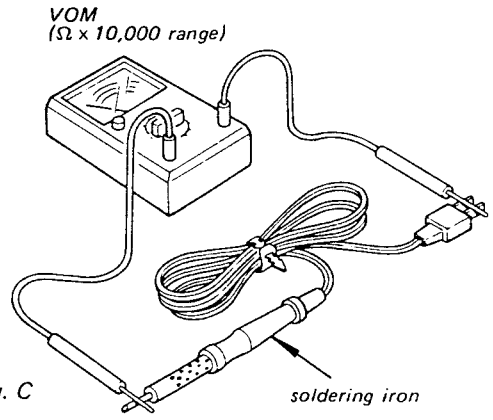


Fig. C

3. Equalize any potential difference between the clothes, the tools in use, the work bench, the set being worked on, and the packaged IC by touching them all in succession with the hands or a conductive wire or tool.
4. The following are effective methods for handling ICs that remove the potential difference across the oxide layer.
   - Use a paper clip modified by soldering in a wire braid insert.

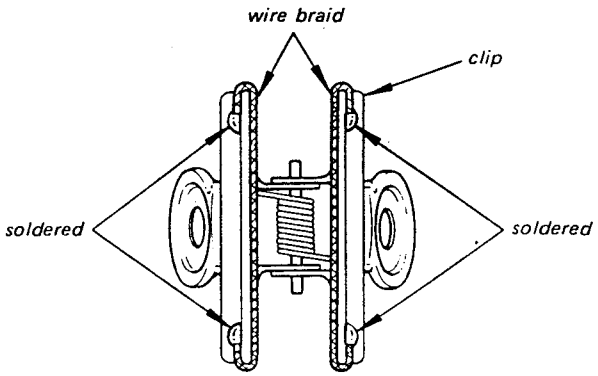


Fig. D Make sure that there is no solder on the inside.

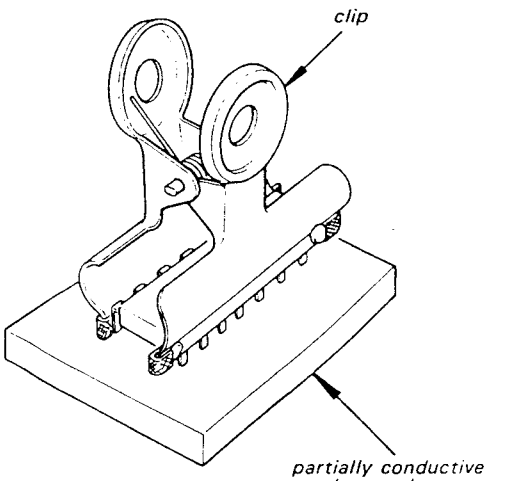
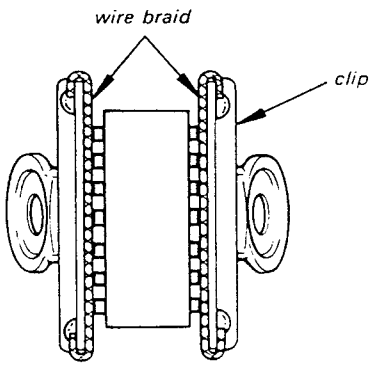


Fig. E



Make sure that all the pins are in contact with the wire braid (all the pins will then be at the same potential.).

Fig. F

- Take a short length of fine bare wire and wind it around the IC so that it shorts all the pins of the IC, while it is still in the urethane-polyester cushion or aluminum foil. This ensures that all the pins are at the same potential.

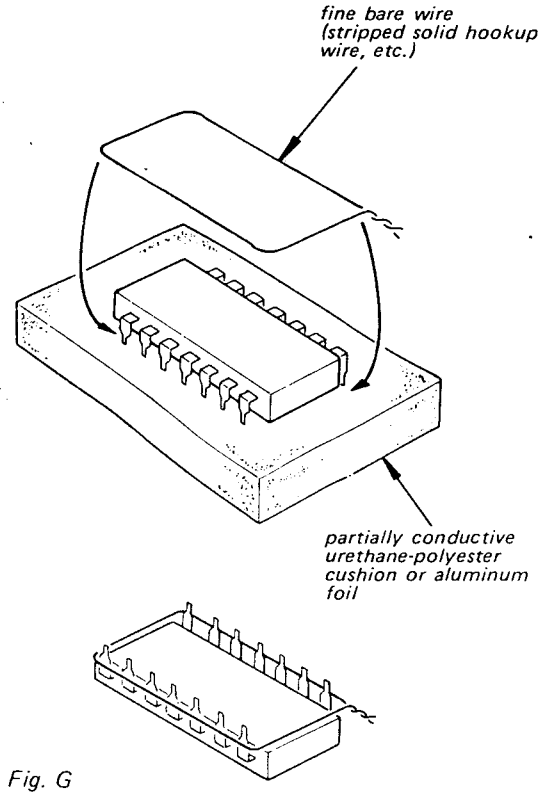


Fig. G

- When it is necessary to handle the IC with the fingers, do not touch any pin, and hold the IC at the ends of its plastic-package ase as shown in Fig. H.

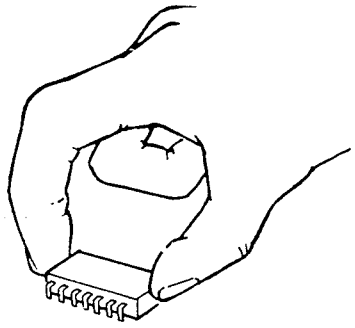


Fig. H

5. Method of Mounting
Insert the IC while holding it with the modified clip, and solder all the pins with the clip still shorting the pins. (Similarly, solder all the pins while the bare shorting wire is still wound around them.). Remove the clip or the bare shorting wire only after all the pins have been soldered.

Precaution while Checking C-MOS ICs

The C-MOS ICs (Complementary MOS) are MOS ICs that have their output sections made up of N-channel and P-channel push-pull stages to increase their speed of operation. If the output terminal of these ICs comes into contact with B+ or B- voltage, then the FET which is ON at that time will either become shorted or open.

This is valid for all the output sections that are connected together by the interconnections. Even the circuits that are physically separated (and not on the same board) can be destroyed simultaneously.

Example:

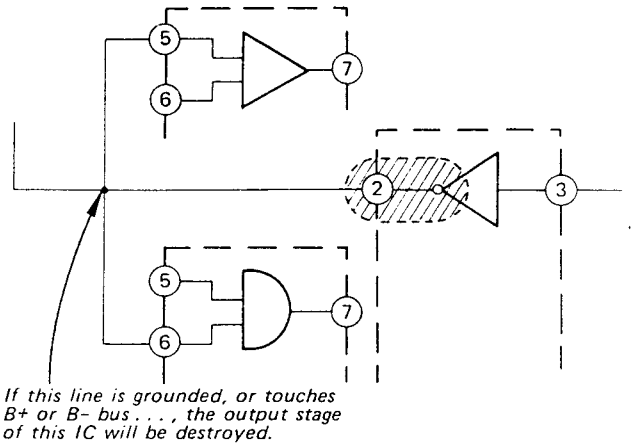
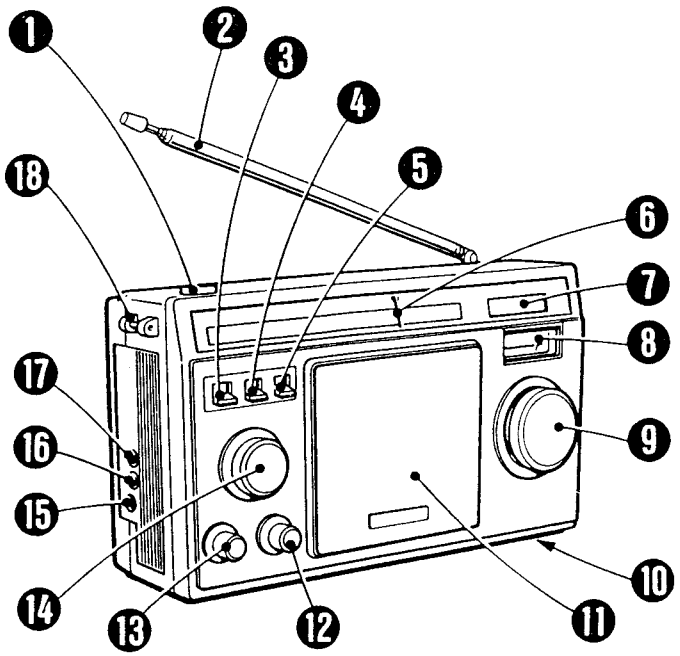


Fig. I

LOCATION AND FUNCTION OF CONTROLS



Key marks on the front panel
■ for SW reception
□ for MW and LW reception

❶ LIGHT button
While operating, depress the button to illuminate the frequency counter and TUNING meter.

❷ Telescopic antenna
Used for FM and SW reception.

❸ POWER switch
Set to ON to turn on the power. After using, set to OFF.

❹ AM SENS (AM sensitivity) switch
Used for SW, MW and LW reception.

❺ BFO (beat frequency oscillator) switch
Used for SSB/CW reception.

❻ Dial scale and pointer

❼ Frequency counter

❽ TUNING meter

❾ TUNING knob
Turn to tune the frequency of the desired station, as marked on the dial scale so that the pointer of the TUNING meter swings to the right as far as possible.
Pull the knob and turn for precise tuning.

❿ Battery compartment (bottom)

⓫ Speaker

⓬ TONE control
Turn to MUSIC to enhance both low and high frequency signals and to NEWS to suppress them.

⓭ VOLUME control
Turn clockwise for more volume.

⓮ BAND selector switch
Choose the desired band; MW, LW, SW_1, SW_2, SW_3 or FM.
The frequency range of the selected band will appear on the dial scale.

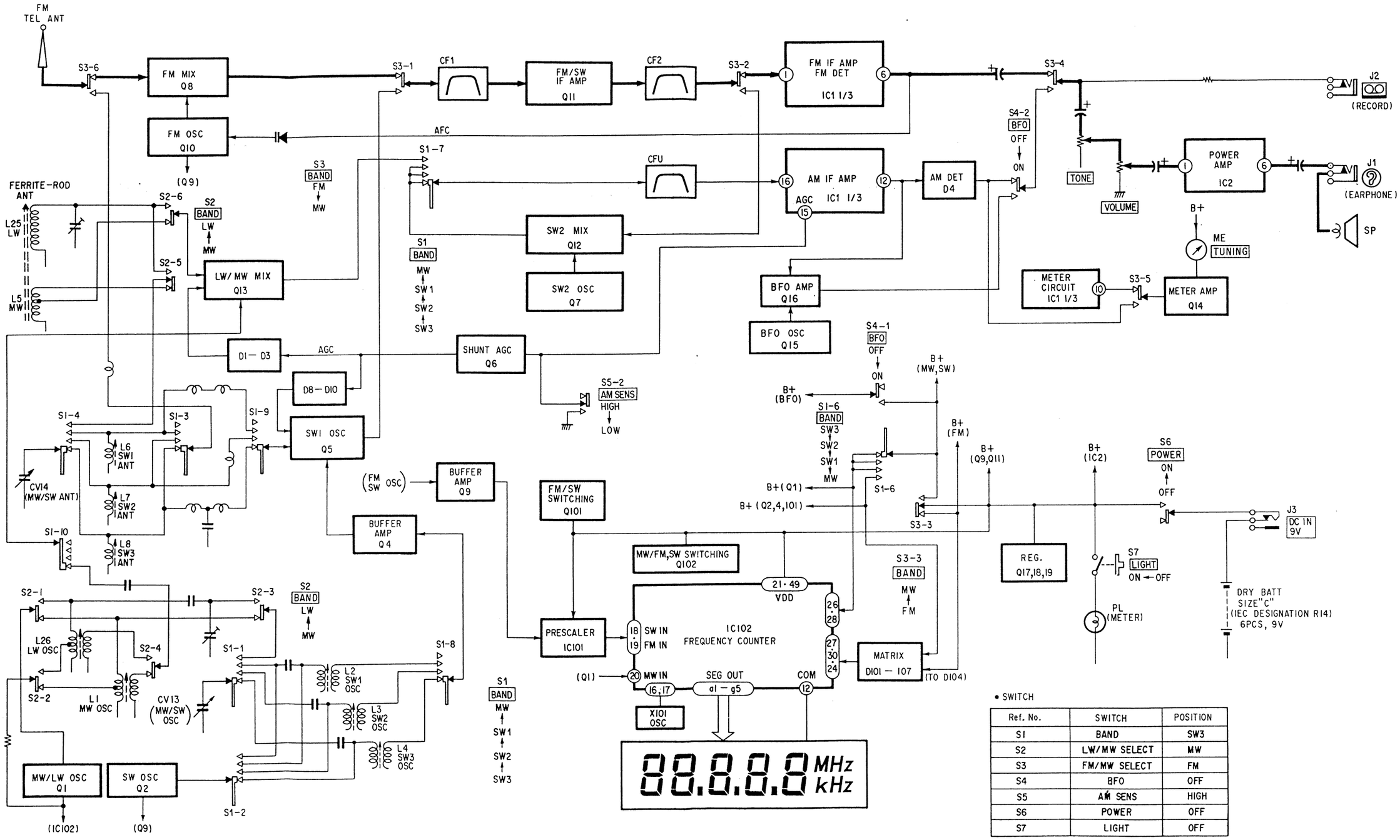
⓯ DC IN 9 V jack
For operation on car battery.

⓰ ⓟ (earphone) jack
For private listening with an earphone.

⓱ ⌨ (recording output) jack
For recording radio programs with a tape recorder.

⓲ Strap loop
See the illustrations on the right column.

SECTION 1
BLOCK DIAGRAM



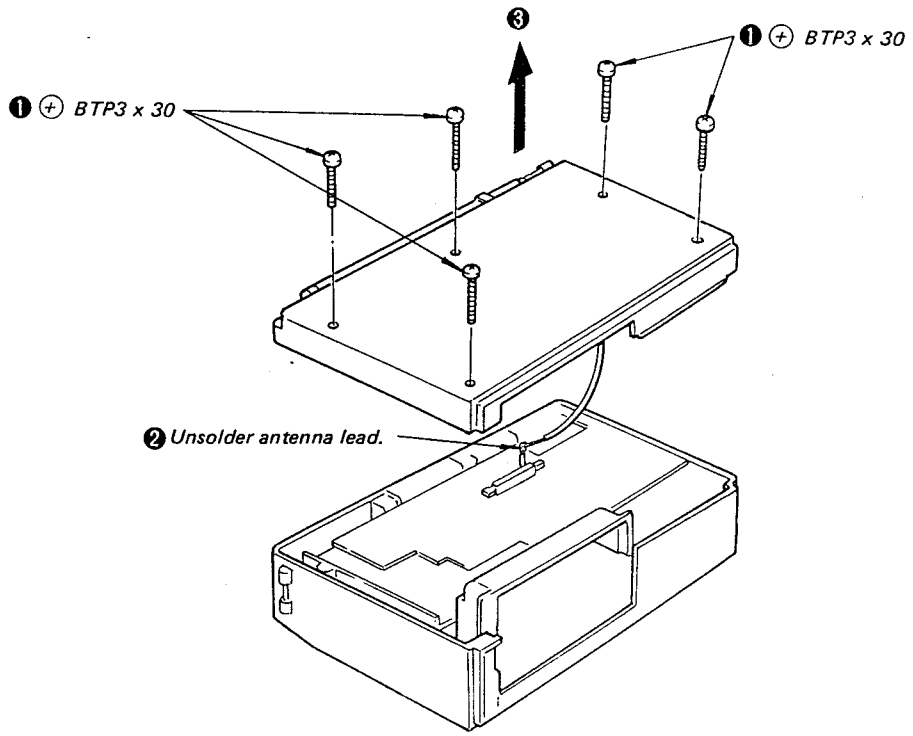
• SWITCH

Ref. No.	SWITCH	POSITION
S1	BAND	SW3
S2	LW/MW SELECT	MW
S3	FM/MW SELECT	FM
S4	BFO	OFF
S5	AM SENS	HIGH
S6	POWER	OFF
S7	LIGHT	OFF

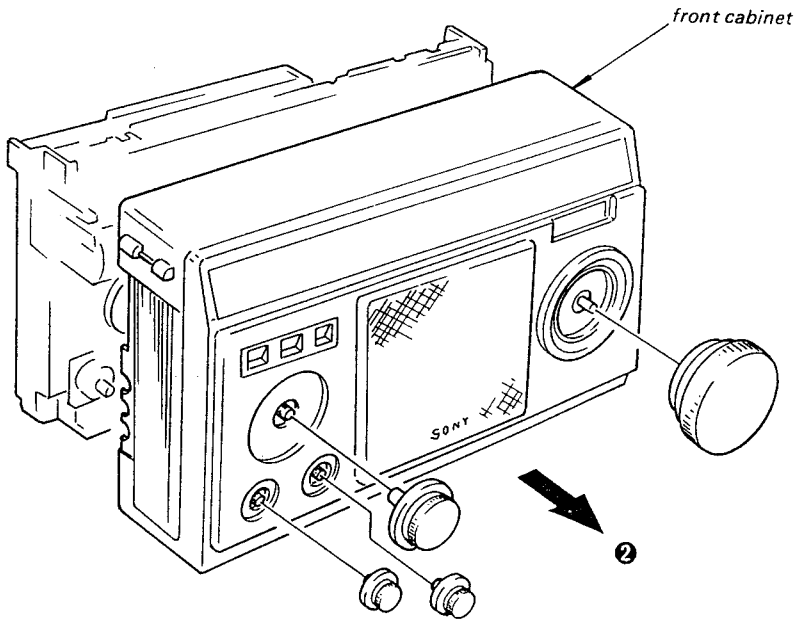
SECTION 2
DISASSEMBLY

Note: Follow the disassembly procedure in the numerical order given.

Rear Cabinet Removal

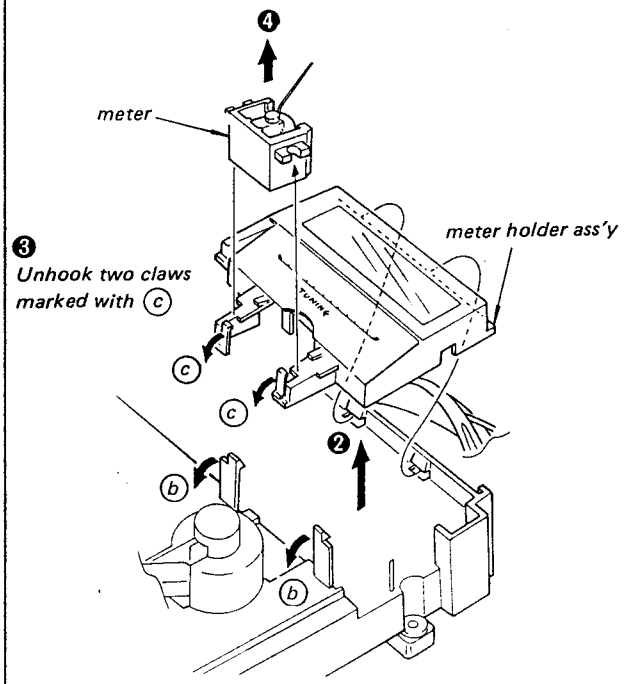


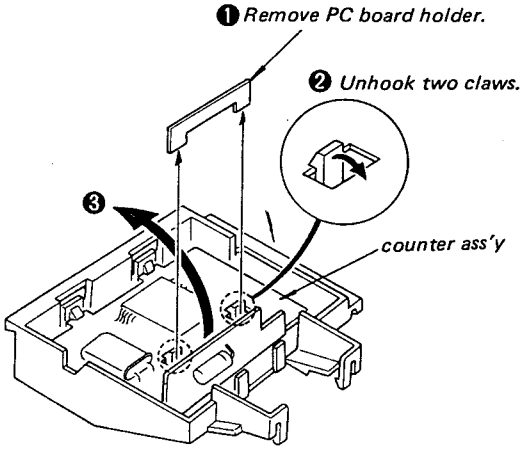
Front Cabinet Removal



Meter Holder Ass'y and Counter Ass'y Removal

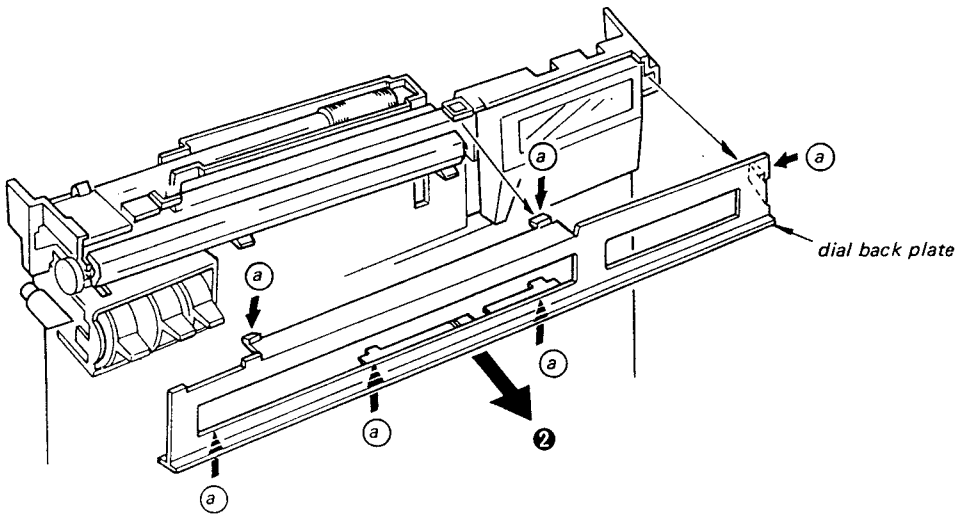
Perform in the order ❸ , ❹ when meter only is removed.



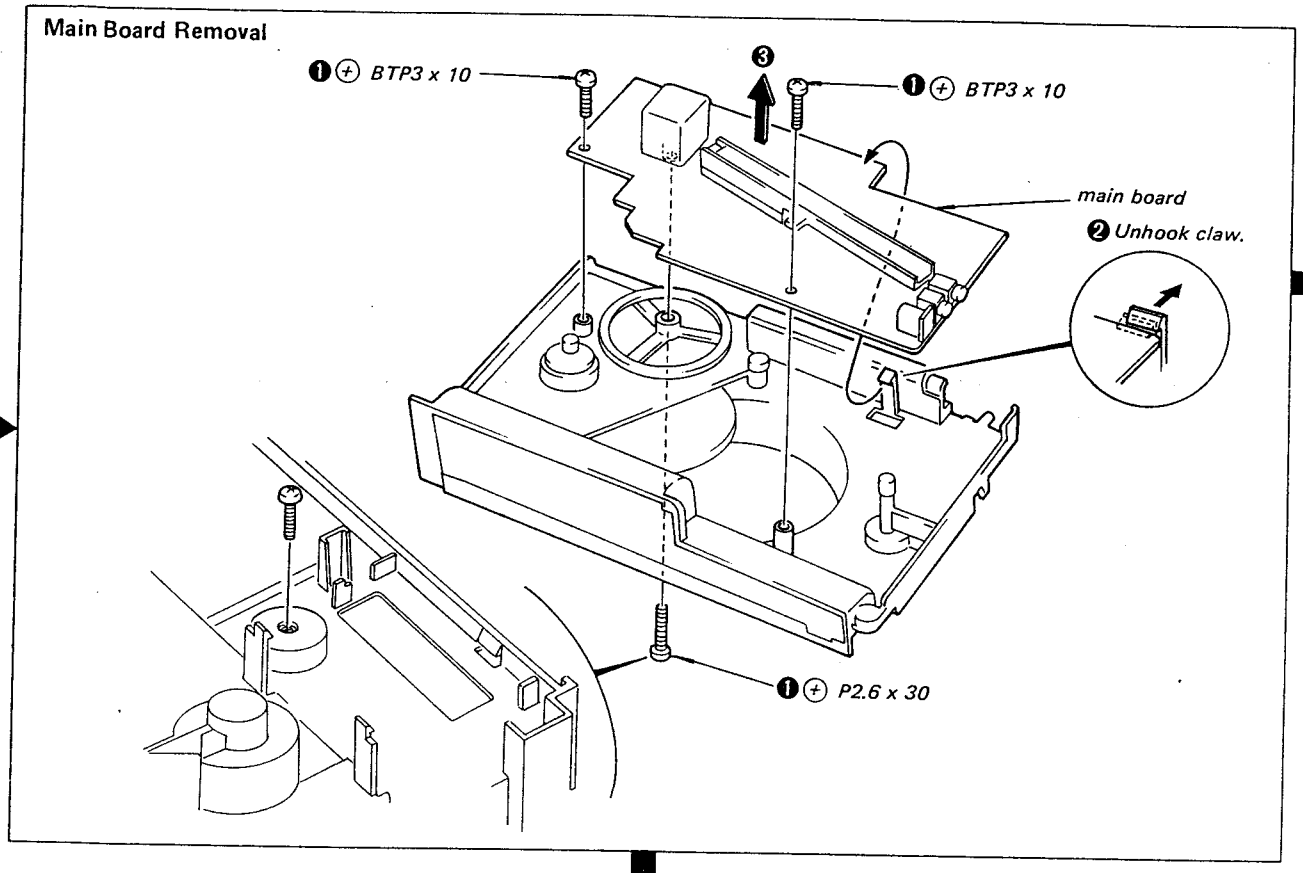


- Cord Stringing for Band Selection (See page 15.)

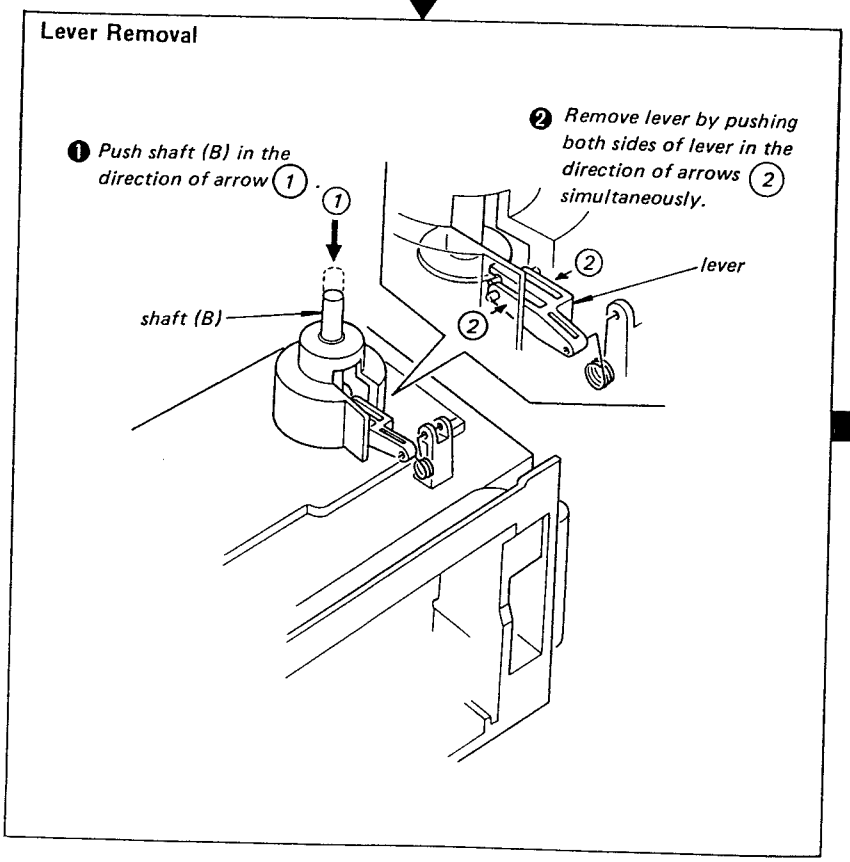
- Meter Holder Assembling (See page 13 .)



Main Board Removal



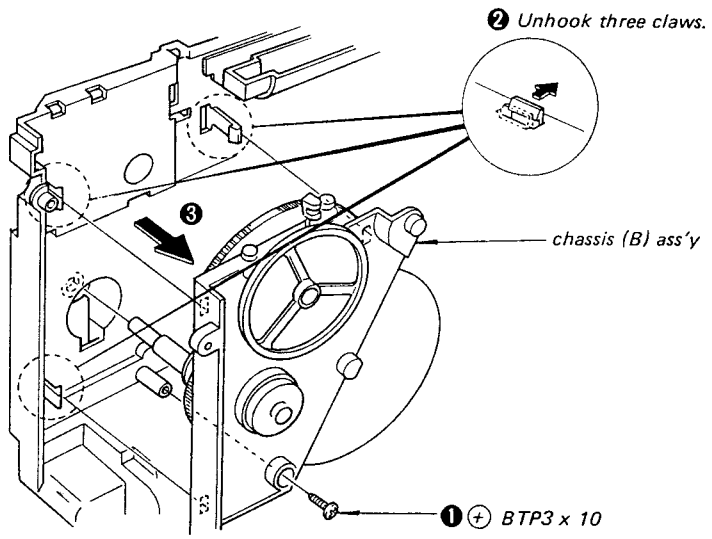
Lever Removal


❶ Push shaft (B) in the direction of arrow (1)
❷ Remove lever by pushing both sides of lever in the direction of arrows (2) simultaneously.
(1)
(2)
(2)
lever
shaft (B)

- Dial Cord Stringing
  (See page 16.)

- Switch Holder Installation
  (See page 14.)

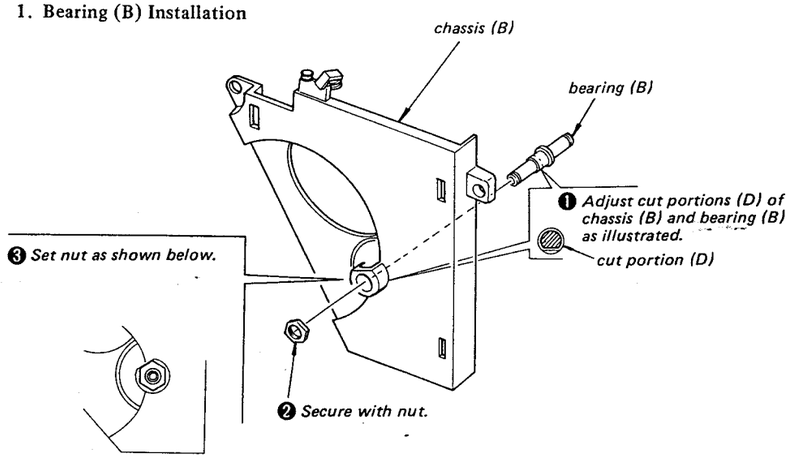
Chassis (B) Ass'y Removal



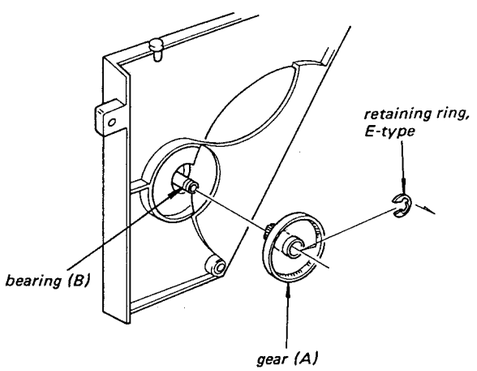
- Chassis (B) Assembling
  (See pages 11, 12.)

CHASSIS (B) ASSEMBLING

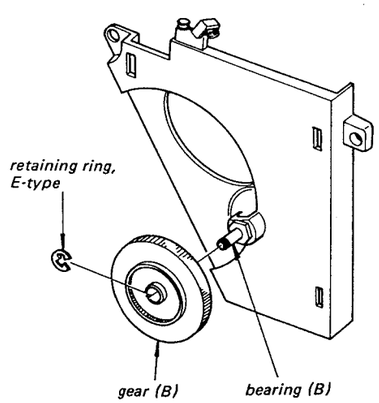
1. Bearing (B) Installation


chassis (B)
bearing (B)
❶ Adjust cut portions (D) of chassis (B) and bearing (B) as illustrated.
cut portion (D)
❸ Set nut as shown below.
❷ Secure with nut.

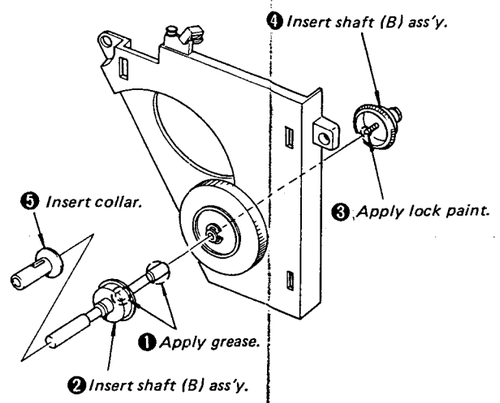
2. Gear (A) Installation



3. Gear (B) Installation

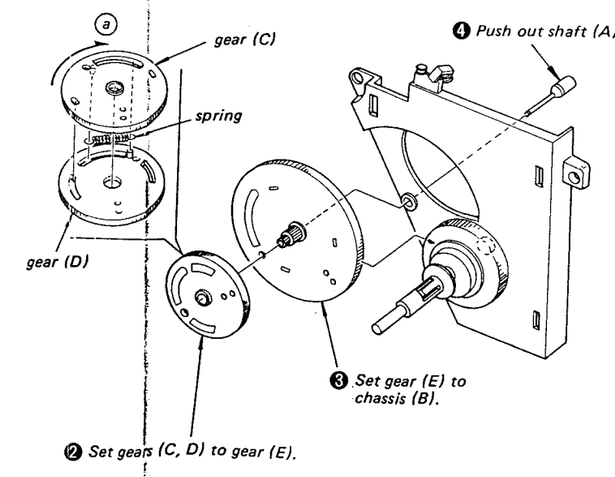


4. Shaft (B) Ass'y Installation

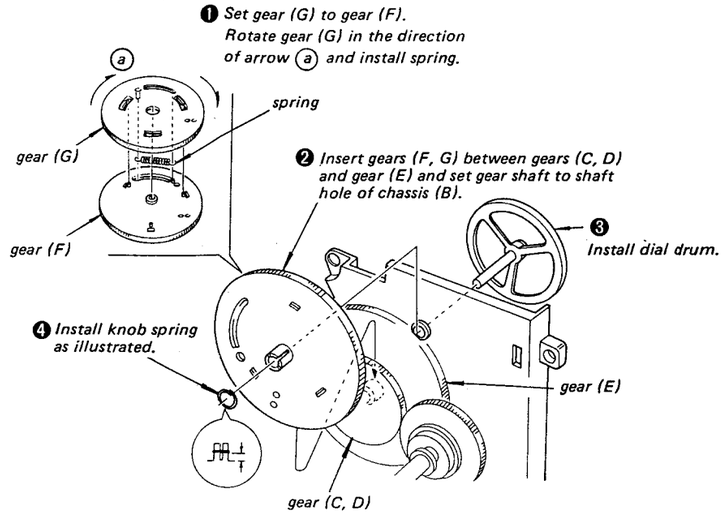


5. Gears (C, D, E) Assembling and Installation

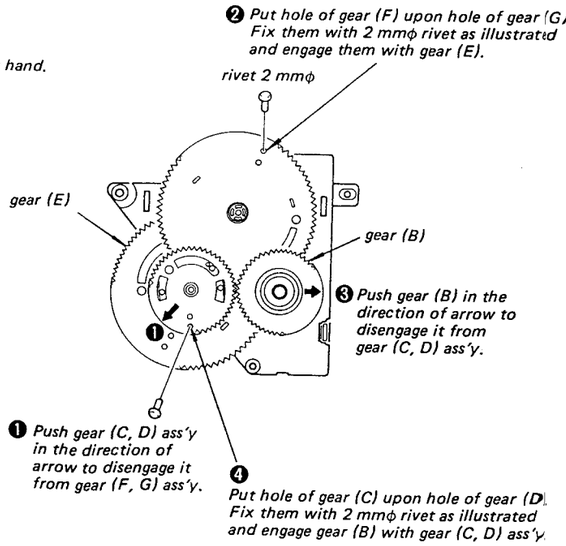
❶ Set gear (C) to gear (D). Rotate gear (C) in the direction of arrow (a) and install spring.



6. Gears (F, G) and Dial Drum Installation

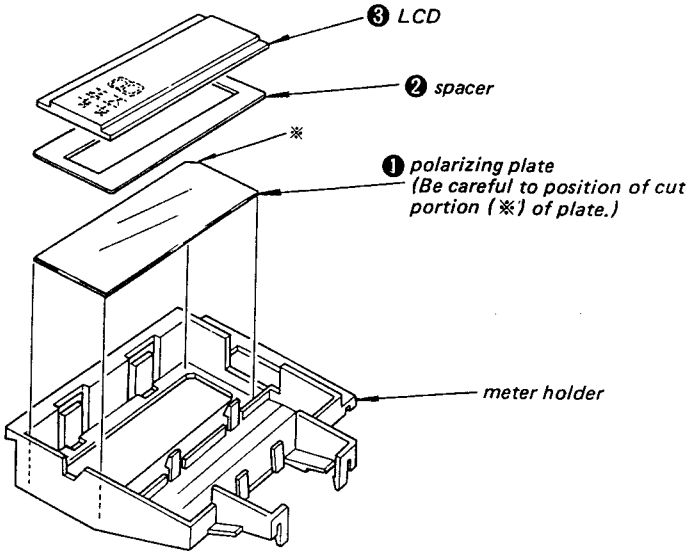

❶ Set gear (G) to gear (F). Rotate gear (G) in the direction of arrow (a) and install spring.
a
spring
gear (G)
gear (F)
❷ Insert gears (F, G) between gears (C, D) and gear (E) and set gear shaft to shaft hole of chassis (B).
❸ Install dial drum.
❹ Install knob spring as illustrated.
gear (E)
gear (C, D)

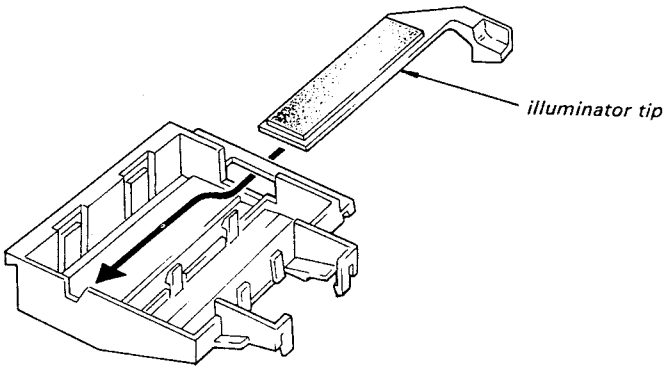
7. Adjustment

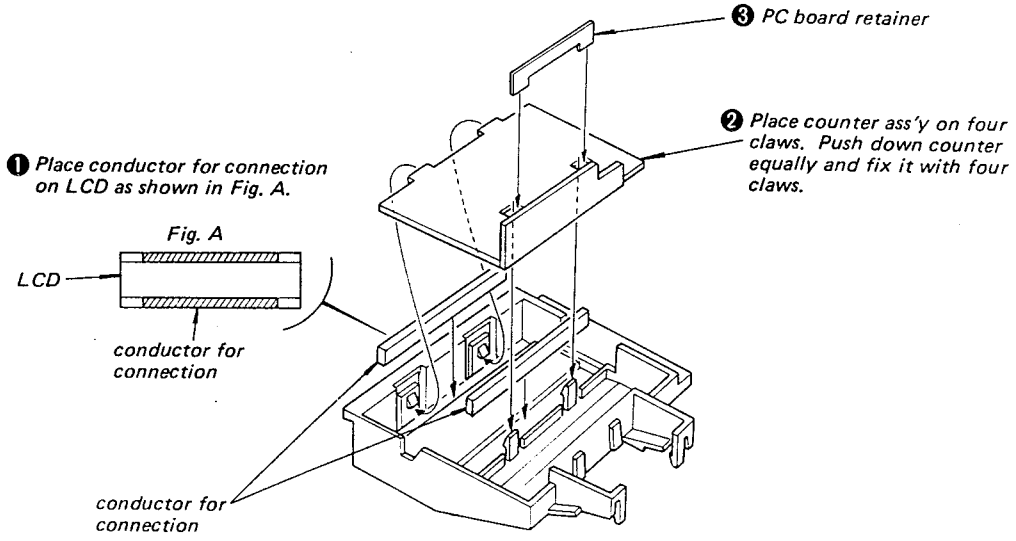

❷ Put hole of gear (F) upon hole of gear (G). Fix them with 2 mmϕ rivet as illustrated and engage them with gear (E).
rivet 2 mmϕ
gear (E)
gear (B)
❸ Push gear (B) in the direction of arrow to disengage it from gear (C, D) ass'y.
❶ Push gear (C, D) ass'y in the direction of arrow to disengage it from gear (F, G) ass'y.
❹ Put hole of gear (C) upon hole of gear (D). Fix them with 2 mmϕ rivet as illustrated and engage gear (B) with gear (C, D) ass'y.

METER HOLDER ASSEMBLING

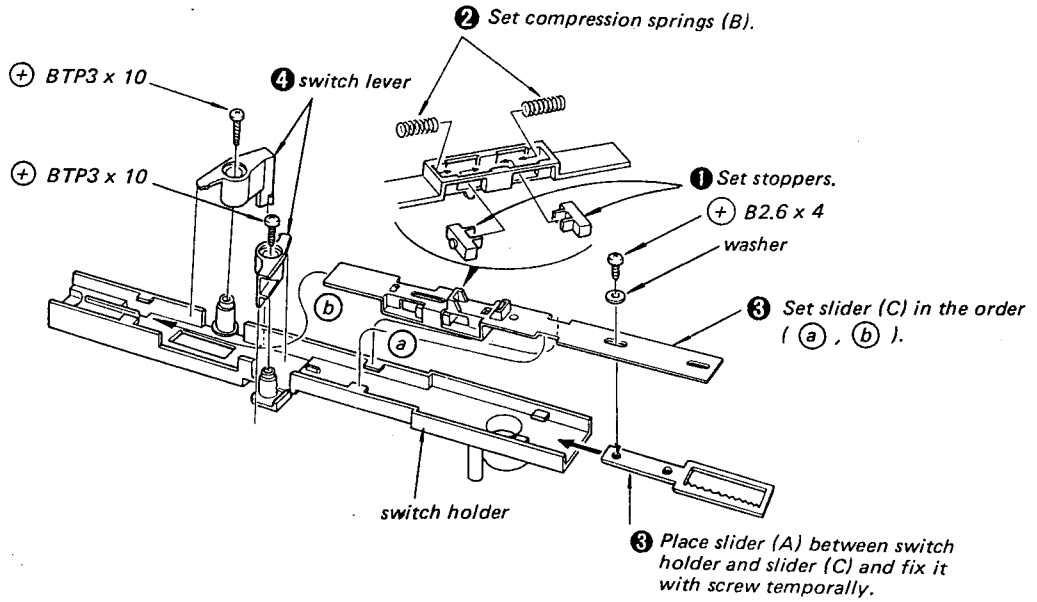
Note: Before installing ❶ , ❷ and ❸ , clean them with soft dry cloth.

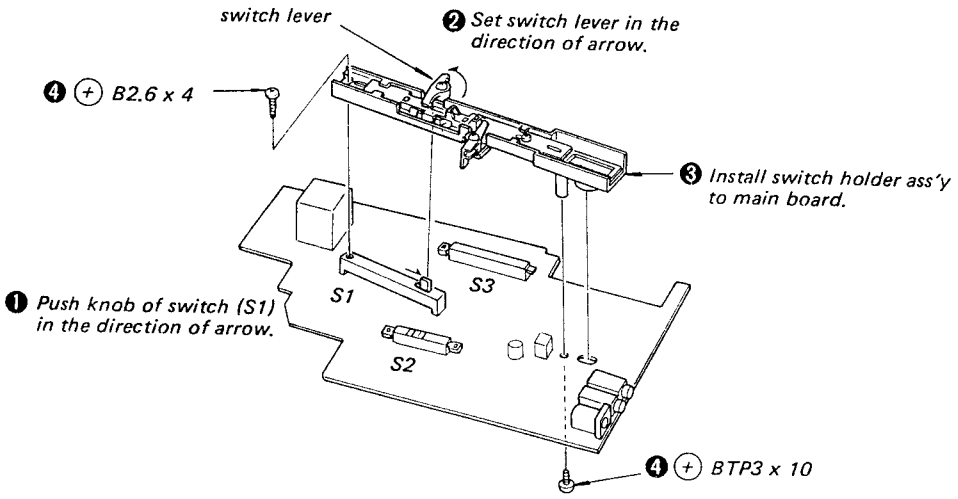


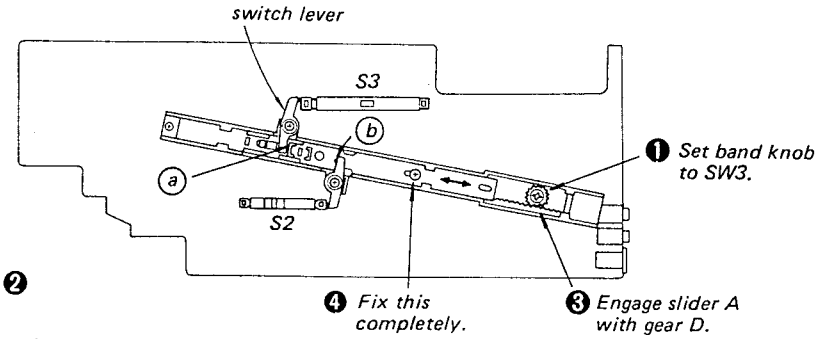



❸ PC board retainer
❷ Place counter ass'y on four claws. Push down counter equally and fix it with four claws.
❶ Place conductor for connection on LCD as shown in Fig. A.
Fig. A
LCD
conductor for connection
conductor for connection

SWITCH HOLDER ASSEMBLING


❷ Set compression springs (B).
⊕ BTP3 x 10
❹ switch lever
⊕ BTP3 x 10
❶ Set stoppers.
⊕ B2.6 x 4
washer
❸ Set slider (C) in the order (ⓐ , ⓑ).
b
a
switch holder
❸ Place slider (A) between switch holder and slider (C) and fix it with screw temporally.


switch lever
❷ Set switch lever in the direction of arrow.
❹ ⊕ B2.6 x 4
❸ Install switch holder ass'y to main board.
S1
S3
S2
❶ Push knob of switch (S1) in the direction of arrow.
❹ ⊕ BTP3 x 10

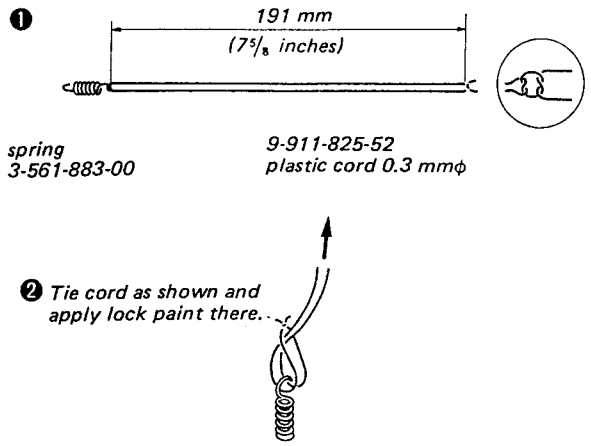


- *After completing procedures ❶ and ❷ set main board.*
- *After completing the adjustments, set the band knob to MW and make sure that the following items are met.*
  1. *ⓑ is no clearance.*
  2. *The switch lever is not pushed.*

❷ *Adjust for no clearance for ⓐ and set S3 not to be pushed by the switch lever.*

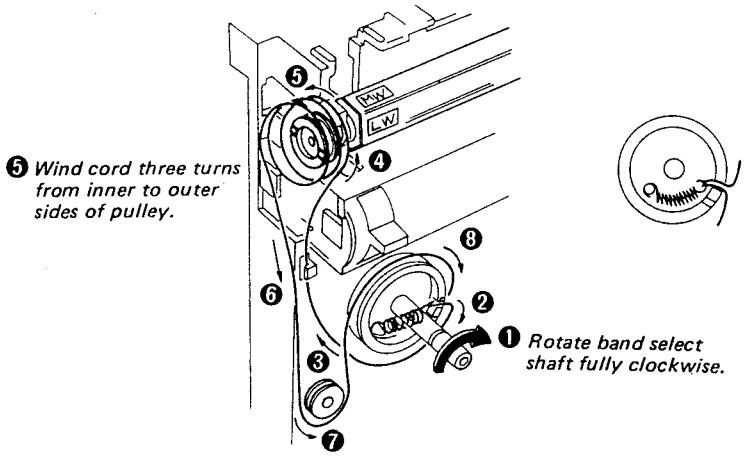
BAND SELECT CORD STRINGING

1. Preparation

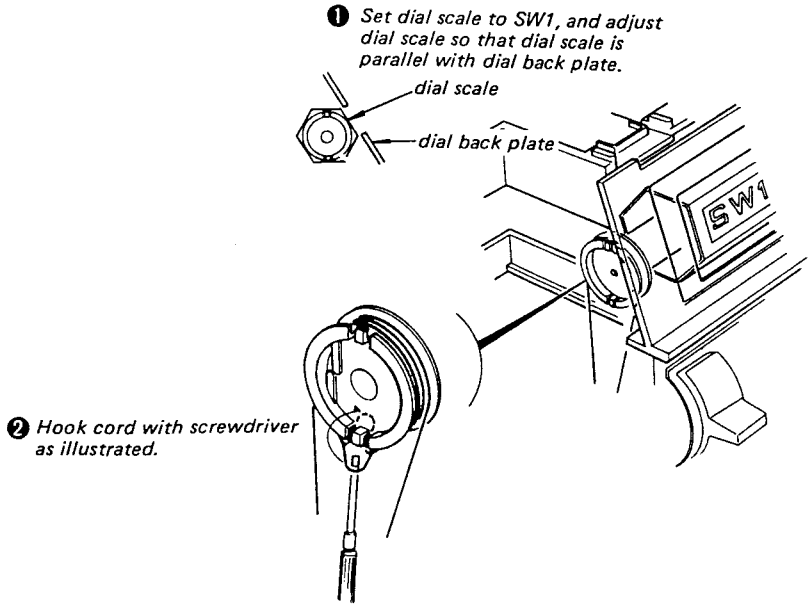


2. Stringing

- Perform in the numerical order given

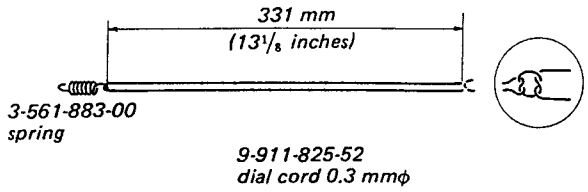


3. Dial Scale Setting


❶ Set dial scale to SW1, and adjust
dial scale so that dial scale is
parallel with dial back plate.
dial scale
dial back plate
SW1
❷ Hook cord with screwdriver
as illustrated.

DIAL CORD STRINGING

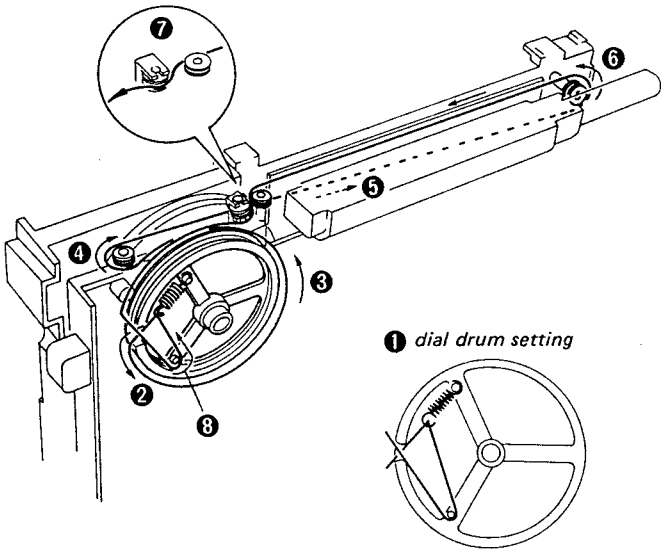
1. Preparation ❶



❷ *Tie cord to spring and apply lock paint there.*

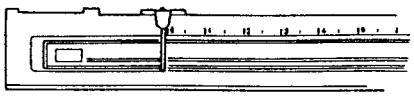
2. Stringing

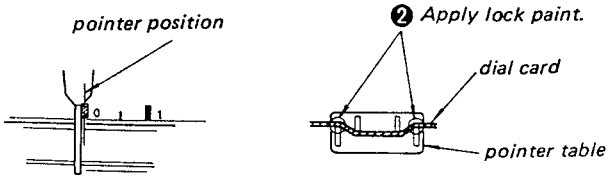
- Perform in the numerical order given.
- Turn tuning shaft fully clockwise.



3. Pointer Setting

❶ *Turn tuning knob fully counterclockwise and set dial pointer to specified position on dial scale.*





SECTION 3
ADJUSTMENTS

1. FM Adjustment

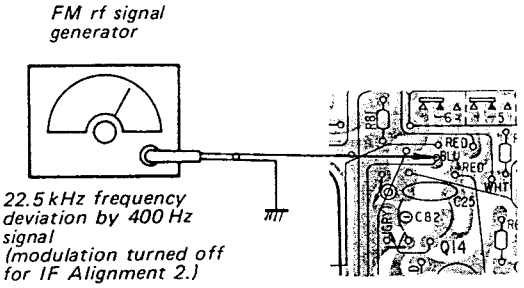
Note: Adjustment should be made in the order of FM, MW and SW.

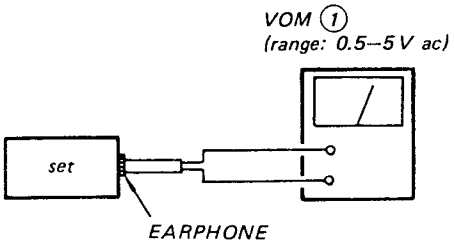
Setting:

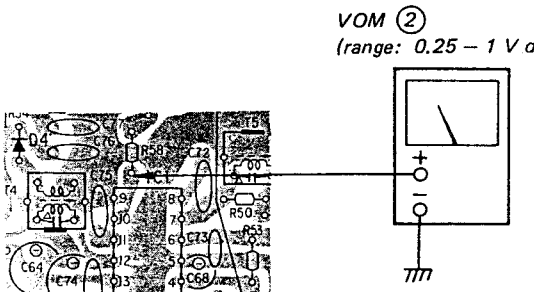
BAND ..... FM
VOLUME ..... MAX
BFO ..... OFF

- Repeat the procedures in each adjustment several times, and the frequency coverage and tracking adjustments should be finally done by the trimmer capacitors.
- When making FM adjustments only, make sure that SW frequency coverage adjustment is done.

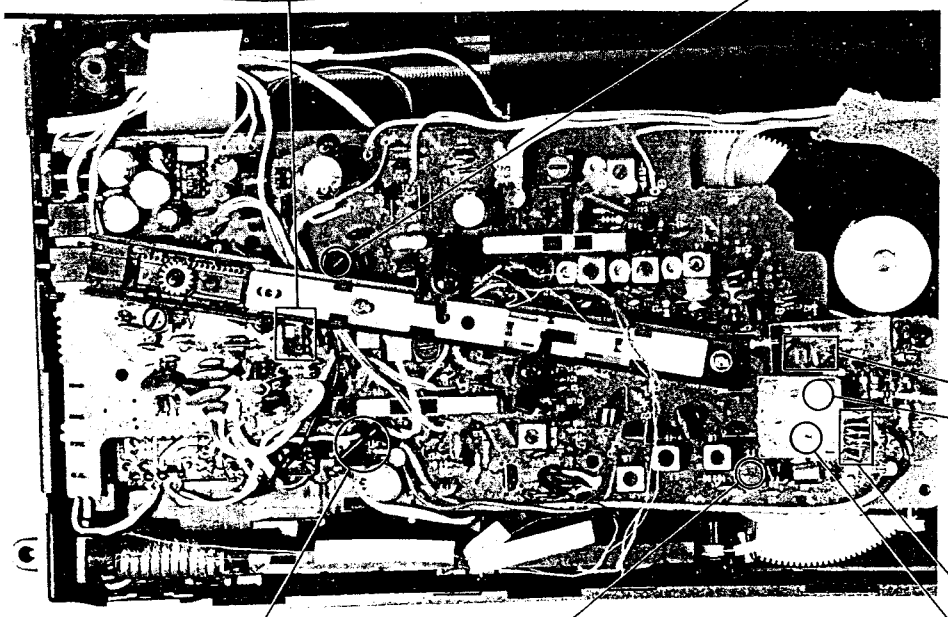
Procedure:







FM IF ALIGNMENT 2 (10.7 MHz with no modulation)
Adjust for 0 V reading on VOM ②.
T5



FREQUENCY COVERAGE ADJUSTMENT	
Adjust for a maximum reading on VOM ①.	
L9	87.35 MHz
CT1-2	107.5 MHz

L10	87.35 MHz
CT1-1	107.5 MHz
Adjust for a maximum reading on VOM ①.	
TRACKING ADJUSTMENT	

FM rf signal generator

T1
Adjust for a maximum reading on VOM ①.
FM IF ALIGNMENT 1 (10.7 MHz with modulation)

2. MW Adjustment

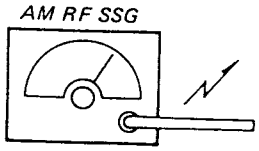
Note: This should be performed after FM adjustment.

Setting:

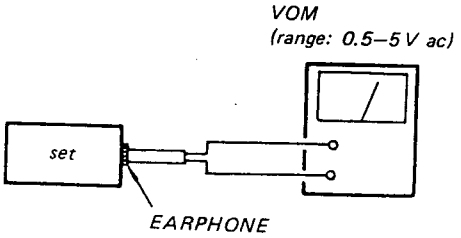
BAND ..... MW
AM SENS ..... HIGH
BFO ..... OFF
VOLUME ..... MAX

- Repeat the procedures in each adjustment several times, and the frequency coverage and tracking adjustments should be finally done by the trimmer capacitors.
- When making MW adjustments only, make sure that SW frequency coverage adjustment is done.

Procedure:

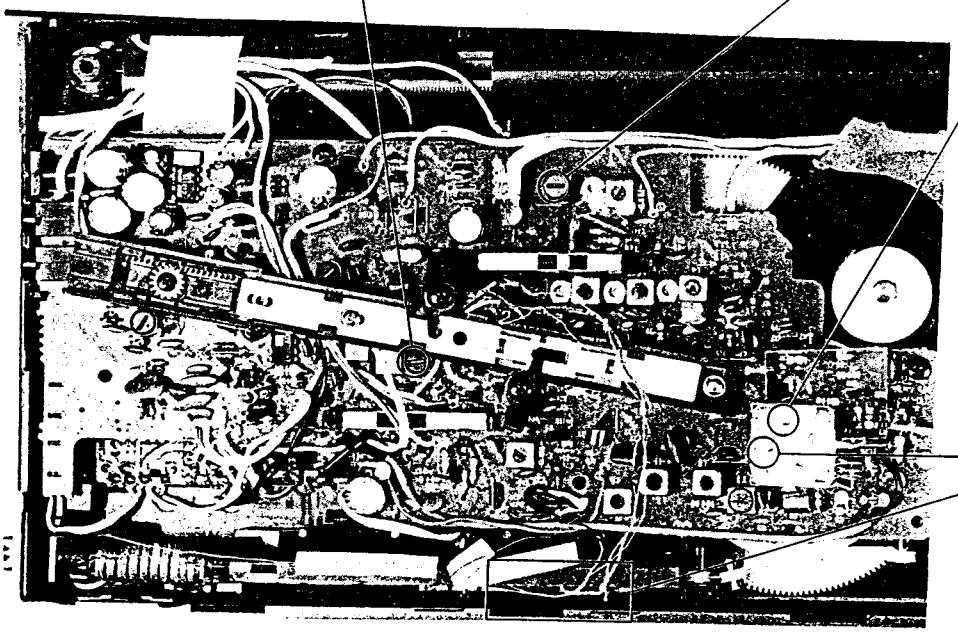


30% amplitude modulation by 400 Hz signal



AM IF ALIGNMENT	
Adjust for a maximum reading on VOM.	
455 kHz	T3

MW FREQUENCY COVERAGE ADJUSTMENT	
Adjust for a maximum reading on VOM.	
520 kHz	1,680 kHz
L1	CT1-3



MW TRACKING ADJUSTMENT	
Adjust for a maximum reading on VOM.	
CT1-4	1,400 kHz
L5	620 kHz

3. LW Adjustment

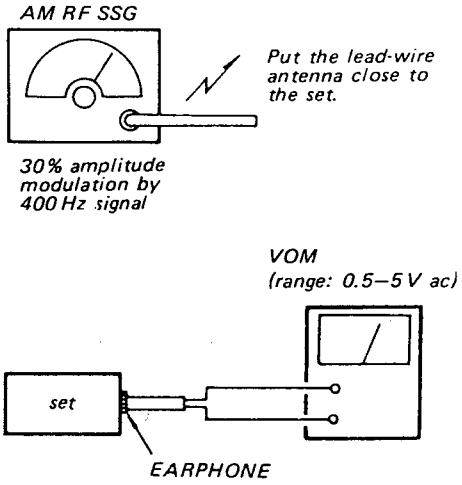
Note: This should be performed after MW adjustment.

Setting:

BAND	LW
AM SENS	HIGH
BFO	OFF
VOLUME	MAX

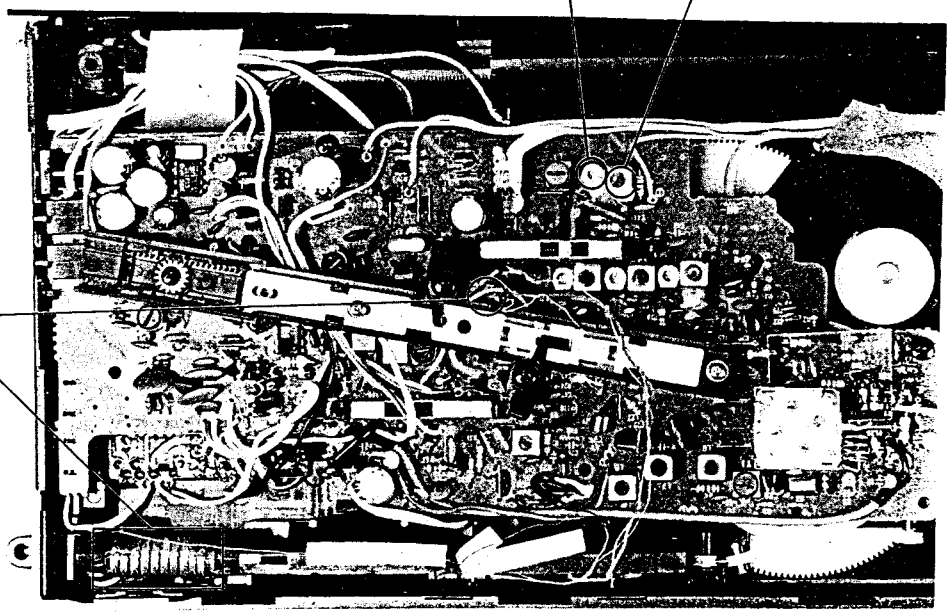
- Repeat the procedures in each adjustment several times, and the frequency coverage and tracking adjustments should be finally done by the trimmer capacitors.
- When making LW adjustments only, make sure that SW frequency coverage adjustment is done.

Procedure:



LW FREQUENCY COVERAGE ADJUSTMENT	
Adjust for a maximum reading on VOM.	
265 kHz	145 kHz
CT-4	L26

LW TRACKING ADJUSTMENT	
Adjust for a maximum reading on VOM.	
250 kHz	CT-5
170 kHz	L25



. SW Adjustment

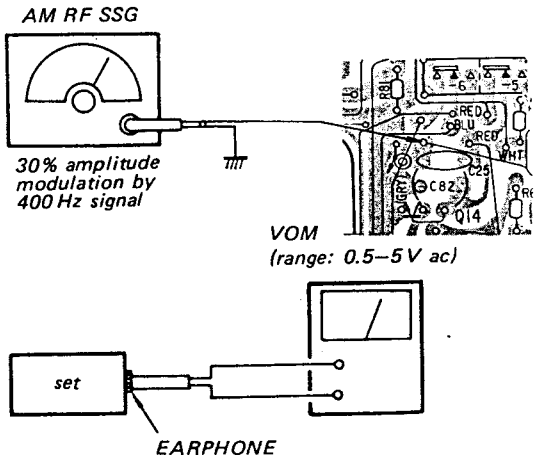
Note: This should be performed after LW adjustment.

tting:

BAND	SW
AM SENS	HIGH
BFO	OFF
VOLUME	MAX

- Repeat the procedures in each adjustment several times, and the frequency coverage and tracking adjustments should be finally done by the trimmer capacitors.
- Perform in the numerical order given.

Procedure:

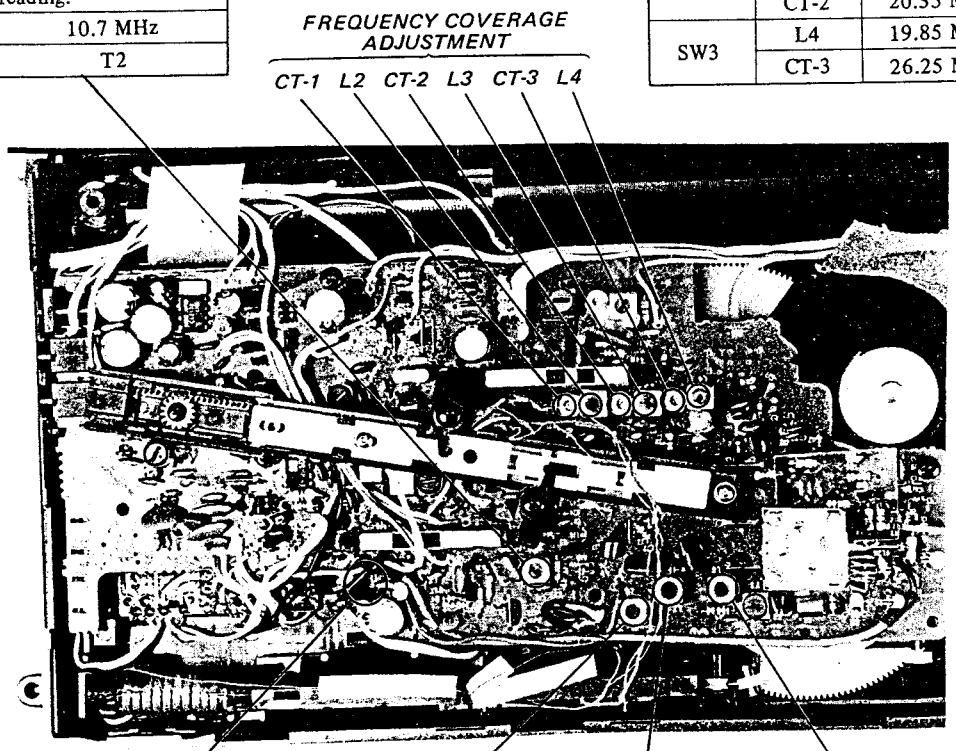


❶

SW3 IF ALIGNMENT
Adjust for a maximum reading.
10.7 MHz
T2

❷

SW FREQUENCY COVERAGE ADJUSTMENT		
SW1	L2	3.8 MHz
	CT-1	10.35 MHz
SW2	L3	11.5 MHz
	CT-2	20.35 MHz
SW3	L4	19.85 MHz
	CT-3	26.25 MHz



❸

L6
3.8 MHz
SW1 TRACKING ADJUSTMENT

❹

L7
11.5 MHz
SW2 TRACKING ADJUSTMENT

❺

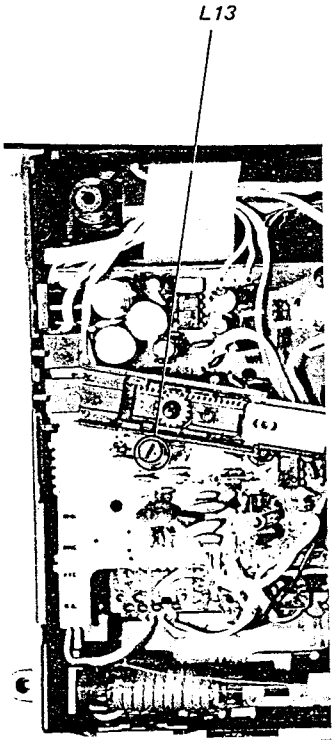
L8
19.85 MHz
SW3 TRACKING ADJUSTMENT

5. BFO Adjustment

Setting:

BAND . . . . . MW
VOLUME . . . . . as low as possible

1. Tune in an off-the-air signal by turning tuning knob.
2. Set BFO switch to ON and adjust L13 so that no beat sound is heard.

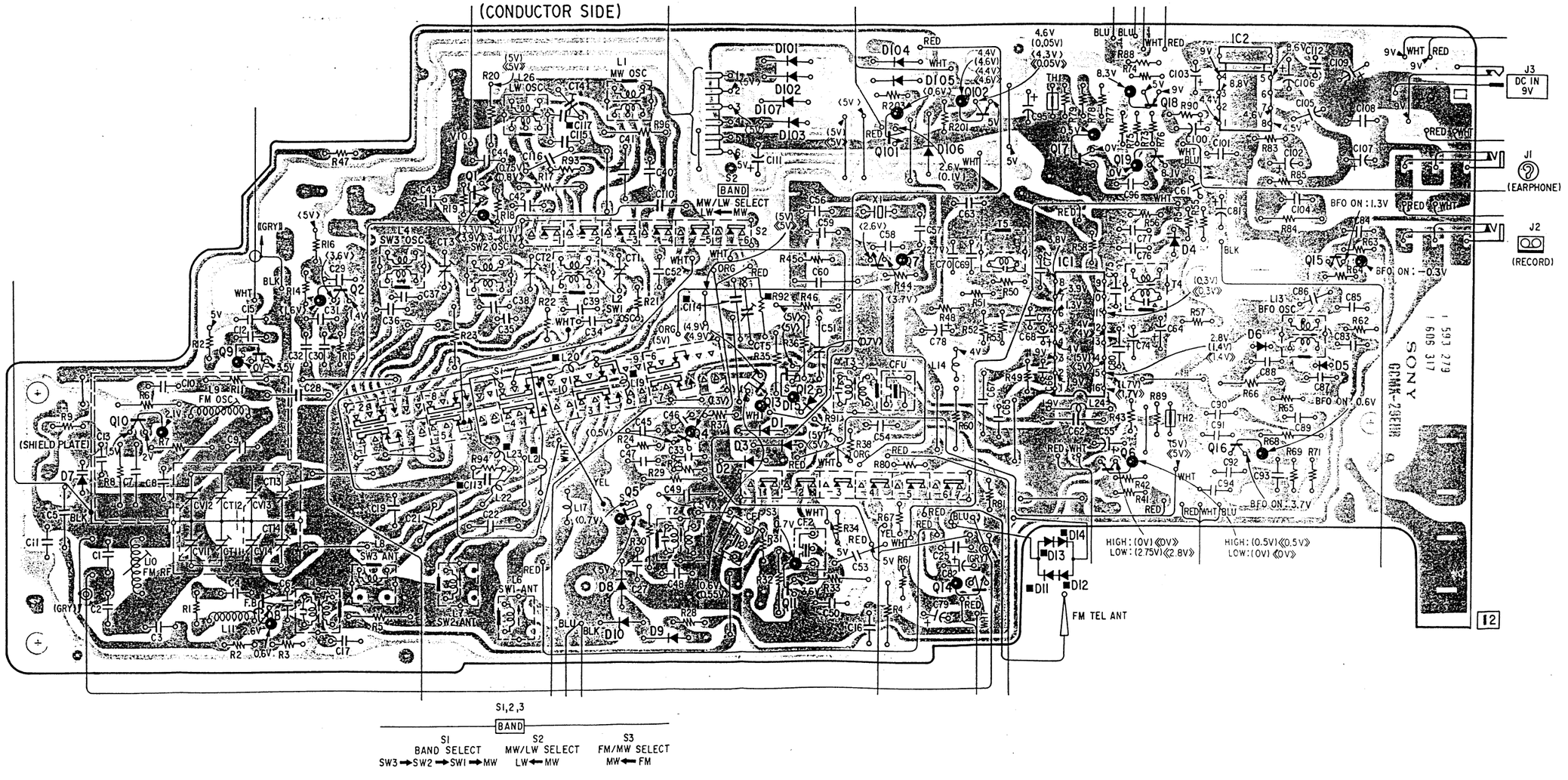


SECTION 4
DIAGRAMS

4-1. MOUNTING DIAGRAM
– Conductor Side –

	A	B	C	D	E	F	G
Q・IC	10	9 8	2 1	5 4 13 12 11	101 7. 102 14	17 19 18 IC2 IC1 6	16 15
D	7		8 10 9	2 1 3	101 102 15 107 103 104 105 106	13,14 11,12	4 6 5

【MAIN BOARD】
(CONDUCTOR SIDE)



S1,2,3
BAND

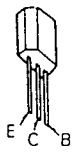
S1	S2	S3
BAND SELECT	MW/LW SELECT	FM/MW SELECT
SW3 → SW2 → SW1 → MW	LW ← MW	MW ← FM

Note:

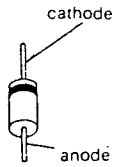
- ○— : parts extracted from the component side.
- ●— : parts extracted from the conductor side.
- ■ : part mounted on the conductor side.
- ⊡ : indicates side identified with part number.
- : B + pattern

Semiconductor Lead Layouts

2SA1027R
2SA733-Q

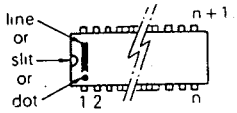


1S1555
1S2139C
1T261
SD-115



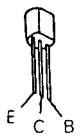
2SC710-13
2SC710-14

KB-4419C

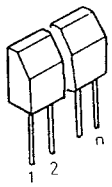


(Top view)

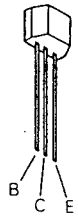
2SC1363
2SC1363-7
2SC1363-8



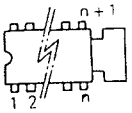
μ54460L



2SC2839
2SC2839E
2SC536SP
2SC536SP-F

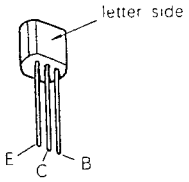


μPC-1213C

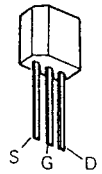


(Top view)

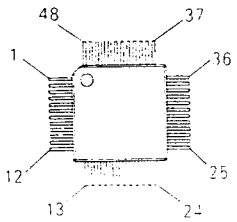
2SC2786-L



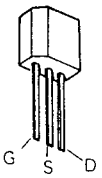
2SK161-0
2SK161
2SK161-Y



MSM5527RS

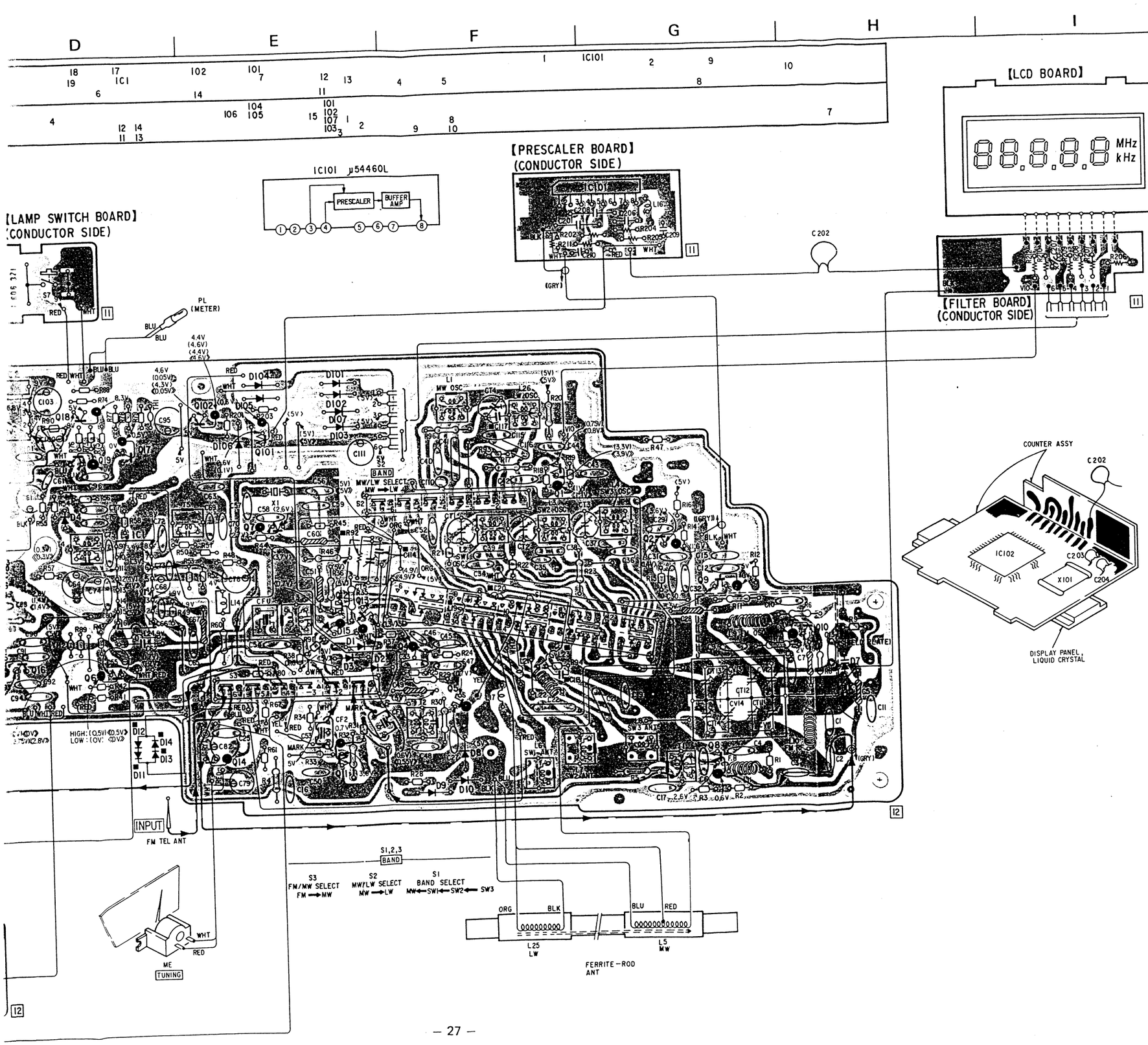


2SK241-Y



ICF-6500L

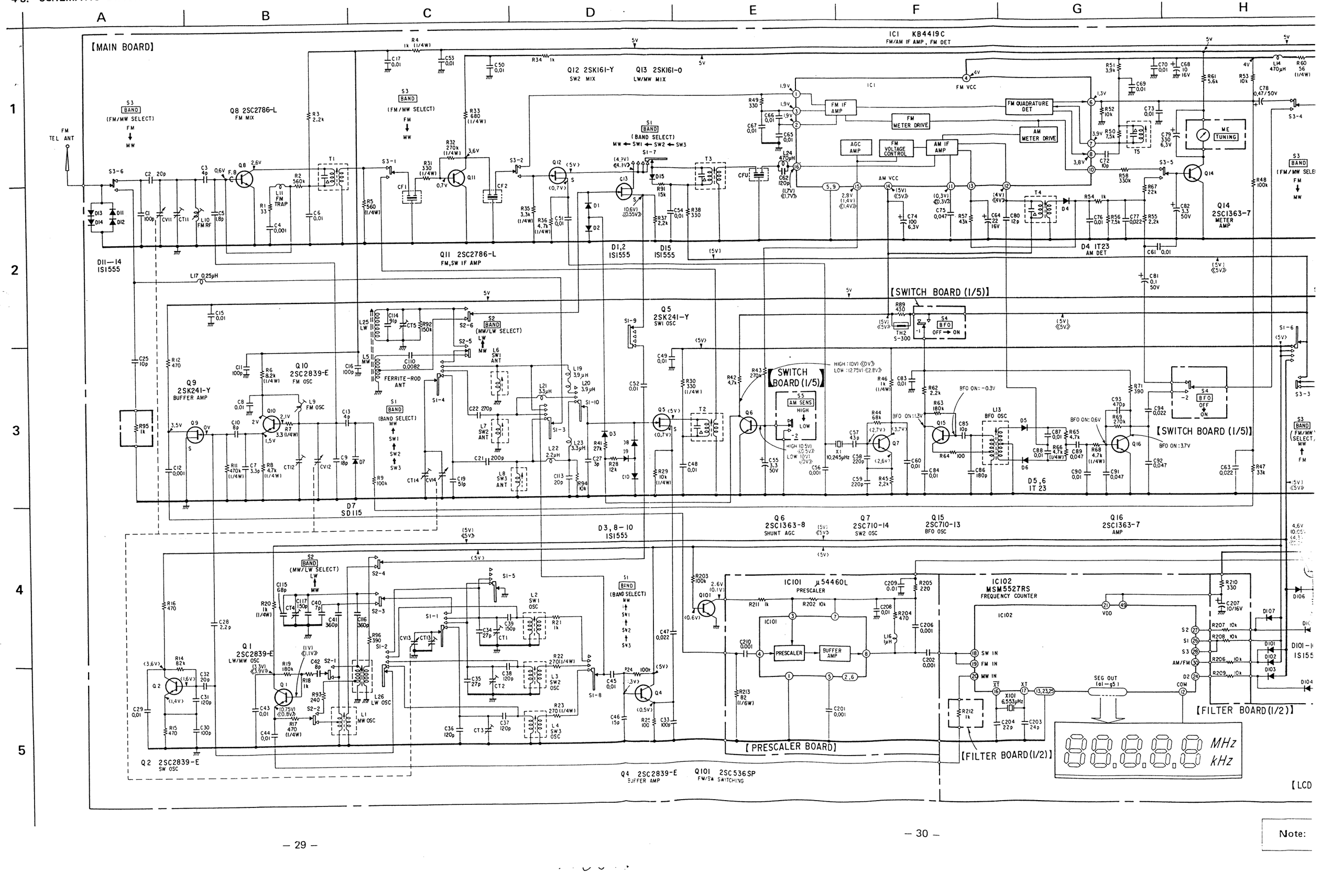
4-2. MOUNTING DIAGRAM — *Component Side* —

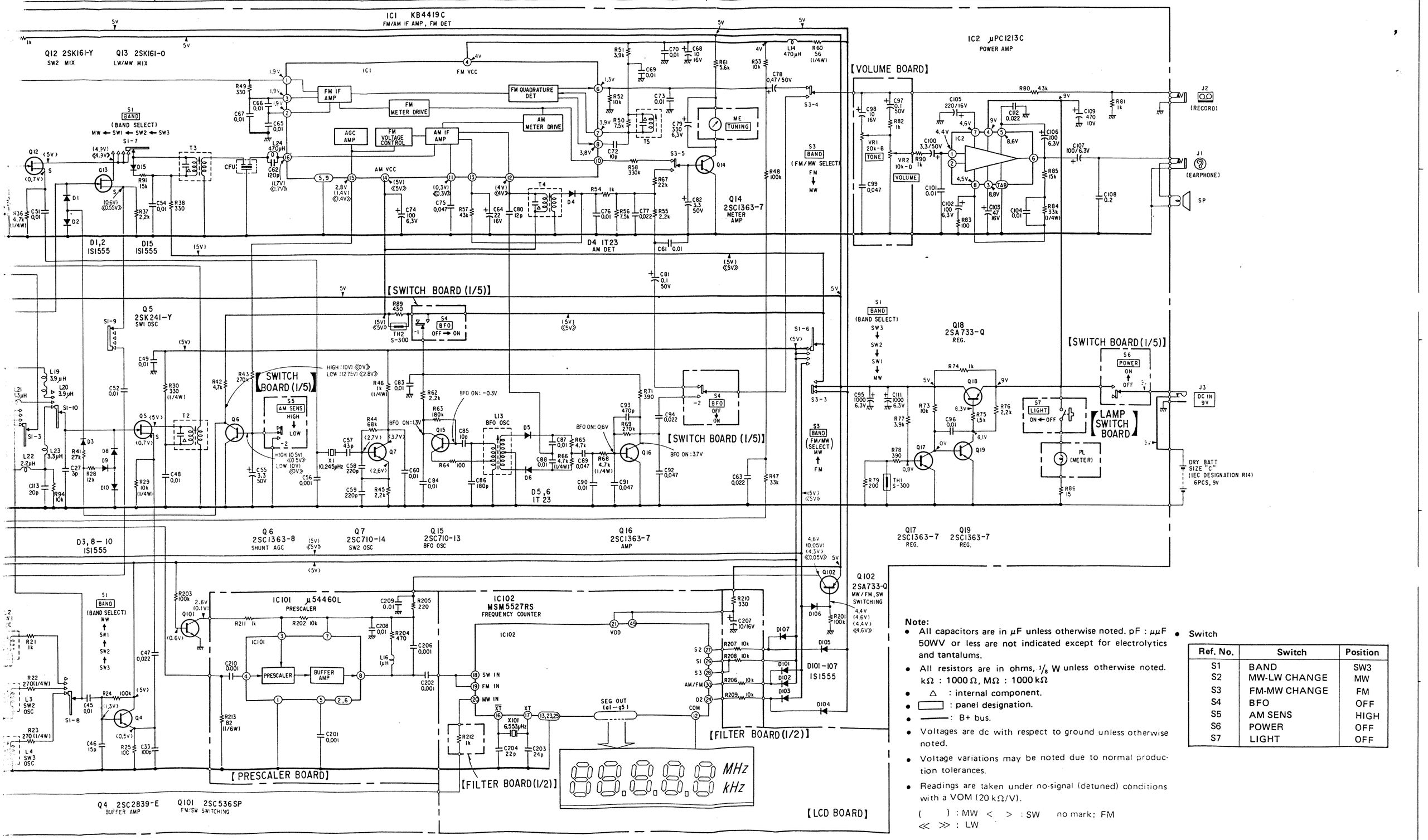


Note:

- ○—: parts extracted from the component side.
- ●—: parts extracted from the conductor side.
- ■ : part mounted on the conductor side.
- [ ]← : indicates side identified with part number.
- : B + pattern
- ▬▶▬ : signal path

4-3. SCHEMATIC DIAGRAM





Note:

- All capacitors are in μF unless otherwise noted. pF : μμF 50WV or less are not indicated except for electrolytics and tantalums.
- All resistors are in ohms, 1/8 W unless otherwise noted. kΩ : 1000 Ω, MΩ : 1000 kΩ
- △ : internal component.
- ▭ : panel designation.
- ——: B+ bus.
- Voltages are dc with respect to ground unless otherwise noted.
- Voltage variations may be noted due to normal production tolerances.
- Readings are taken under no-signal (detuned) conditions with a VOM (20 kΩ/V).

( ) : MW < > : SW no mark: FM
≪ ≫ : LW

- Switch

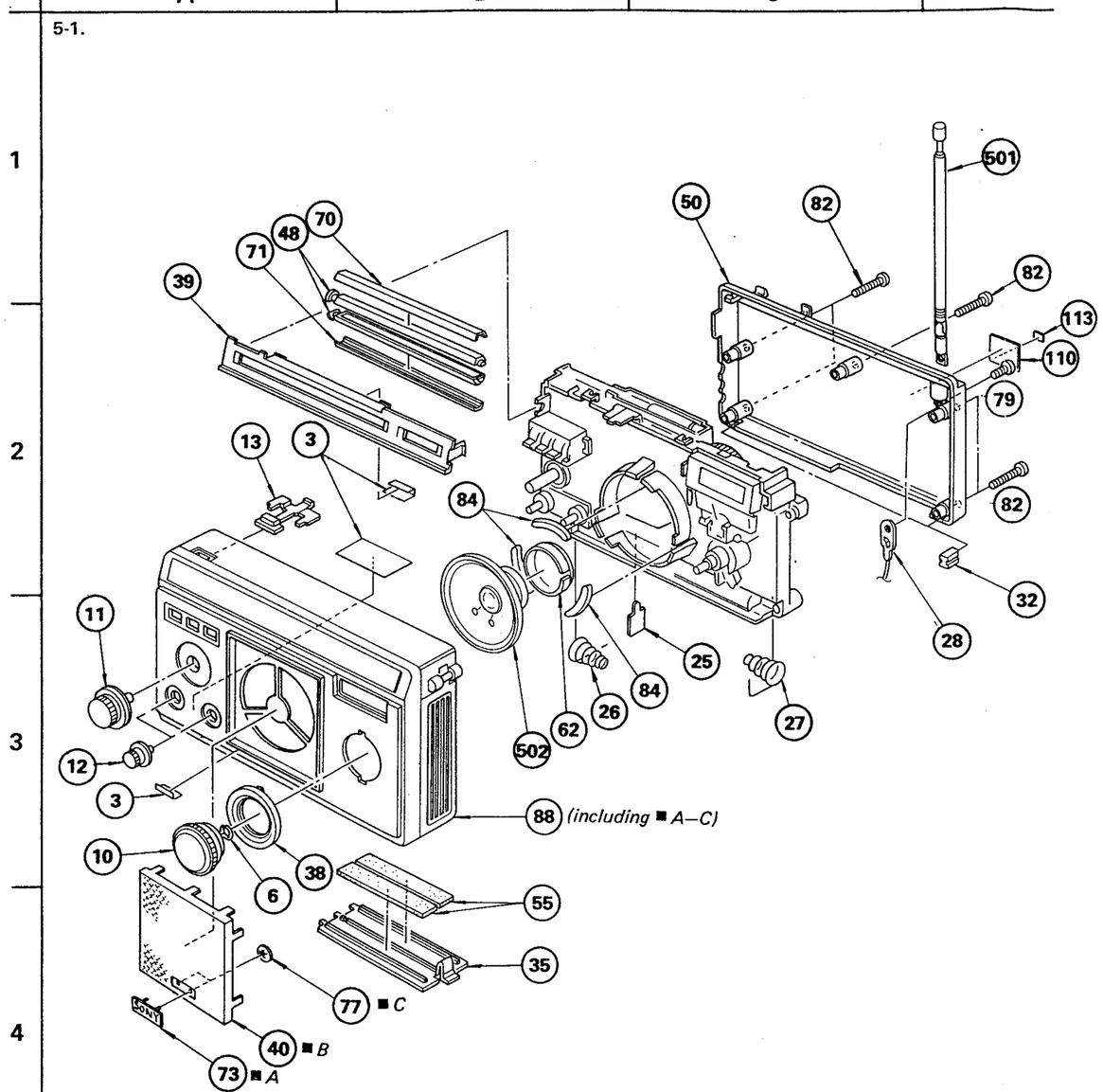
Ref. No.	Switch	Position
S1	BAND	SW3
S2	MW-LW CHANGE	MW
S3	FM-MW CHANGE	FM
S4	BFO	OFF
S5	AM SENS	HIGH
S6	POWER	OFF
S7	LIGHT	OFF

Note: Voltages are measured with a VOM (50kΩ/V).

SECTION 5

EXPLODED VIEWS AND PARTS LIST

5-1.



ICF-6500L

5-2.